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ABSTRACT

The purpose of this field test was to see if young children are capable of producing operationalizations using the "Operationalization of Fuzzy Concepts" procedure. The fuzzy concept used was "having fun in school," and the procedure was conducted with four children aged 7-8. The procedure involved the following five steps: (a) the child was asked to describe a school situation in which s/he was having fun: (b) the child was asked to describe a school situation in which s/he was not having fun; (c) the child was presented with a list compiled by an adult and a child who had been through the first hypothetical situation, and was asked if the items on the list were part of "having fun in school;" (d) the child was asked to review the situation in (a) and revise the list; and (e) the child was asked to review the situation in (b) and revise the list. Validation procedures indicated that the children could operationalize. (The document includes the list used in (c), a list of behaviors which might have indicated trouble operationalizing, an example of responses, and a matrix for organizing and facilitating analysis.) (PB)

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FIELD TEST OF THE OPERATIONALIZATION OF FUZZY CONCEPTS WITH SMALL CHILDREN

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INTRODUCTION

The Fortune/Hutchinson Evaluation Methodology is an operationalized, systematized, standardized set of urles and procedures deisgned to accomplish the defined purpose: to provide data for decision-making about an enterprise (Benedict, 1973). The evaluation of the enterprise is to provide decision-makers about the status of certain operations within the enterprise about which they choose to have data. One of the activities of the Methodology is to have the decision-makers generate the goals that they want the enterprise to accomplish for themselves and others, for the purpose of measuring the extent to which these goals are being met within the enterprise.

Most of the goals that are generated by decision-makers are at a fuzzy level, too fuzzy to be used in any process of measuring to see whether they are being met. This fuzzy level leads to too much uncertainty about the meaning of the goal to know what is to be measured. The Operationalization of Fuzzy Concepts, therefore, is an integral part of the process of goals definition (Hutchinson and Benedict, 1970).

In some educational enterprises students, who may be very young children, may be considered to be decision-makers. That is, students actually make some decisions that are very important, e.g., whether or not they will try to learn. In this case we are concerned with children's goals and children's fuzzy concepts. The purpose of this piece of methodological research, more specifically a field test, is to see if young children are capable of producing operationalizations using the Operationalization of Fuzzy Concepts procedure.

The importance of this study, to determine whether children can operationalize, is that it can potentialize providing children, who are decision-makers in their own right concerning their own activities, with data for decision-making. It can also help to foster the idea that children are people capable of making decisions for themselves.

DESIGN OF THE FIELD TEST

Choice of Age Level

It was decided to use the age group seven eight. It was hypothesized that children of this age could operationalize. The researcher is less sure that this is true for younger children. Should these children not be able to operationalize a second field test would use somewhat older children. Should these children be able to operationalize a second field test would use children who are five or six, and so on. In the long run it should be possible to find the break point.

Choice of Concept to be Operationalized

After consultation with the class, it was decided to use the fuzzy concept, 'having fun in school', as it seemed to be something that children could operationalize easily. It seemed likely that by the age of seven or eight children would know, if not what things about school were fun, then what things were not fun. It seemed then likely that children of this age would be able to generalize from things that were not fun to things that were fun, and therefore be able to operationalize the entire fuzzy concept.

Choice of Sample Size

It was decided to try the procedure out with four children. This number could give enough data to believe that children of this age range either can or cannot operationalize.

If all four children can't operationalize then it is reasonable to believe that many seven and eight year olds can't. If all four can, then it is reasonable to believe that many seven and eight year olds can operationalize. If these data proved inconclusive, one could try again with some different children, the difference depending upon what sort of problems were noticed with the original children. This is because while the ability to

operationalize might be in doubt for some children, it cannot be said, due to inconclusive data, that no children can operationalize. It could be that at this age range some children can and some can't. This field test might yield enough information to generate a hypothesis or two about such differences.

Choice of Experimental Conditions

It was chosen to have the facilitator alone with each child to reduce the chance of confusion which could be caused as each child, in a group, would talk aloud in response to the tasks given to them. It was also planned that they should respond by talking to the requests rather than in writing, which might be studying writing skills rather than operationalization skills.

Rewriting of the Procedure

It was also decided to rewrite the five steps into language thought to be understandable by children. Each step would be read to each child. The original operationalization procedure has five steps. It was decided to split steps four and five into two parts apiece (see Appendix). Step four requests of the person undergoing the procedure to once again picture himself as having fun in school, as he did in step one, and he is asked to tell things about the image which he did not talk about before, since it is assumed that by now, after having also imagined himself as not having fun in school, he will have more ideas of what he means by having fun in school. Also in step four, the person is asked to tell why these things are not a part of having fun in school. For purposes of this study this latter task was separated into a second part of step four, with pauses between parts, to give the child time to think and reduce possible confusion produced by the child being asked to do two tasks simultaneously.

A similar revision was made with step five. The first part of step

five asks the child to think up things having nothing to do with having fun in school and to think about them. After a pause the child isasked to respond to the second part of step five, which requests the child to tell whether each thing he was thinking about in part one has anything to do with having fun in school. This was for the sake of clarity, and reduction of possible confusion on the part of the child.

After revision of the original five steps it was decided that a checking process should be added at the end of each step as can be seen from the attached Appendix. This was to insure that each child meant what he said about parts of 'having fun in school', so that the researcher would not necessarily take everything the child said, perhaps off the top of his head, as what he necessarily meant as part of 'having fun in school'. The checking process, based on the work of Mehta (1973), consisted of asking the child as he verbalized each item in response to a request whether he was sure that this was (was not) a part of having fun in school, so as to make more certain that the child agrees that this is what he means by having (not having) fun in school.

Choice of Test of Completeness Material

It was also decided for test of completeness material (step three) to ask both an adult and a child to go through the revised step one to generate parts of what they mean by 'having fun in school'. An adult's re-membered experience plus a child's experience would give each subject child a more complete list from which to consider what he means by 'having fun in school'. The adult used is a twenty-five-year-old senior at the University of Massachusetts, Amherst. An adult is used so that a different perspective by generation might be used by a child to define other levels of dimension of his concept of 'having fun in school' which may not be

possible with another child's experience. The child used is a nine-year old. The test of completeness material thus generated is attached.

DATA COLLECTION AND ANALYSIS

For purposes of organization and facilitating the analysis it was decided to form a matrix, a copy of which is attached, the column variable of which would correspond to the five steps of the operationalization procedure (I through V) and the row variable of which would correspond to the four children who are the subjects for this field test (a through d). Each block would contain the responses, after the checking process, of the administering of a step to a child: for example, block Ia would contain the responses, after the checking process of child a to step I of the operationalization process, block IIb would contain the responses of child b to step II, and so on. The matrix would also contain blocks for column totals, which would contain some conclusions that could be made about what the children did with each of the five steps, how effective each step was with the children, and a block for matrix total, which would contain conclusions about the effectiveness of the operationalization process with children.

This matrix would benefit the entire piece of research by providing a means of collection and organization of verbal data, facilitating the combining of both verbal and non-verbal data (described below) to come to conclusions about the effectiveness of the operationalization process with children. For example, if for a child the verbal data shows a consistent fuzziness running through many of the steps, and if some behavioral data indicate possible difficulty with the tasks, it may be a possible conclusion that this child was not able to operationalize.

It was decided to generate procedures which, by observing each child while doing the tasks, would lend to the ability to make educated guesses

as to what the nature of the problem was with any child who seemed to have problems operationalizing, or responding to the tasks. Since it was decided to gather each child's verbal data by means of a tape recorder, the researcher is free to observe and write down the child's reactions as he attempted to operationalize according to the instructions. If the child has trouble carrying out the requests these data may suggest why the child had trouble.

Some of the behaviors which could possibly occur are --that the child is restless in his seat, keeps asking what he is supposed to do, and sits for a period of time and does not say anything, all of which point to a conclusion that the child is having trouble. A list of these behaviors is attached.

IMPLEMENTATION OF THE FIELD TEST

On two consecutive days in May, 1973, the researcher carried out the field test with four children, ages seven and eight. There were two boys and two girls. Each child was taken out of class activities. The procedure was administered in the Teachers' lounge and certain other behaviors were recorded by the researcher. The individual testings were tape recorded.

The field test went nearly as planned. The checking process prepared in conjunction with responses from steps one and two (see appendix) were not done by the researcher, largely due to her being engrossed with recording behaviors and the conversations.

On the first day, a boy and a girl in that order were tested. The boy, Timmy, was very talkative, gave much output in response to the requests, and seemed to enjoy the session. Things went along uneventfully with the exception of the point where some teachers came in, began to talk loudly, and seemed to have nearly broken Timmy's train of thought. However, with

some restatement of the request he seemed to carry on with it very well.

The girl, Bobbie, came up with less information although she was wqually willing to comply with requests. During the last part of the session Bobbie seemed to run out of ideas and seemed to have more trouble with steps four and five then with the earlier steps.

The following day another boy and girl, in that order were taken to the teachers' lounge and tested. The boy, David, when I told him the nature of what I was going to ask him to do, saying that I was going to ask him to define what 'having fun in school' means for him, said immediately that he hated school and didn't think anything about it was fun. I put him through the five steps; he did think of some things that were fun about school.

The last child tested, Andrea, seemed to enjoy doing the procedures. She generated much response, especially to the test of completeness items with step three, and the testing procedure went along well.

Conclusions from the Results of the Field Test

Given the results of this field test, it is possible to make some general conclusions about the Operationalization of Fuzzy Concepts procedure. One conclusion is that children can operationalize. Each of the four children tested were able to come up with operational components of the fuzzy concept 'having fun in school' at various stages of the procedure.

The first child named some operational components as the result of going through Step I: "Me and Scott are playing Easy Money," "He picks up a card," and "I throw the dice and get a 5 on one and a 5 on the other." In Step II, this child became operational again: "I got hit in the head with the ball in a baseball game".

The second child also was operational as the result of Step I: "I'm playing with blocks", and "I'm making a picture of Mrs. Backer," and of Step II: "Nobody's playing with me."

The third child came up with an operational item as a result of Step I: "I'm going on the slide," and of Step IV: "I'm playing at home and digging up the treasure chest with the money I got for my birthday".

The fourth child to undergo the test also became operational as a result of going through Step I: "I'm going to Mrs. Backer's desk and it's clean-up time", and of StepII: "...I got in trouble and had to go sit in the chair..."

It seems a fair conclusion to make from the above data that children can operationalize, since these children could come up with operational components of a fuzzy concept.

Another conclusion that is possible to be made is that the checking process included with the original process is more facilitative for a person to make clearer to himself what he imagines as being a component of a particular fuzzy concept, than if the checking process were not included. That is, when the checking process is included a person is required to re-examine each component that he names to make sure whether it is indeed a component of what he means by the fuzzy concept. This serves to check for any rambling which may not actually be a part of the person's fuzzy concept, but which would be allowed to stand if the checking process were not included.

As mentioned above, the researcher neglected to carry out the checking process with Steps I and II; therefore, the discussion following will only concern the data collected for Steps III, IV, and V. Regarding Step III, the checking process, as can be seen from the appended procedures, was that the child, after having a test of completeness item read off to him, was asked to say whether it was a part of what he meant by 'having fun in school' or whether it made him think of anything else that was part of 'having fun in school' for him. The difference between the structures of the original operationalization procedures for this step and this experimental step is

that, although instructions for both steps are alike, the instructions are repeated verbally in the experimental step after each item is read off. This is the checking process for the experimental Step III, and it was to serve to help clarify further for each child in a repetition of instructions what components were included in his fuzzy concept.

The first child named many additions to his component list as he stated that some of the items were part of what he meant by 'having fun in school'; for example, when the item 'spring day' was read to him, he responded that it was a part of 'having fun in school' for him, and in addition gave a reason why (not required) which was because spring days are fun "when we play games". When the item 'teacher talking to someone whose feelings are hurt' was read, he responded that this was not a part of 'having fun in school' for him, and again gave a reason, which was because he doesn't "like hurt feelings". In addition, he thought of many additional things from the stimulus of the test of completeness items that were a part of 'having fun in school' for him; for example, when the item 'playing baseball' was read to him, he responded that it was "fun", and that it made him think of basketball as also part of 'having fun in school'.

It would seem that the checking process for Step III was successful as a facilitator for the child to be more sure of what he meant and did not mean by 'having fun in school'. Each child was able to say whether an item read to him was part of his fuzzy concept, and of what additional things each item made him think as a part of what 'having fun in school' meant for him.

In Step IV, the checking process consisted of having each child, after having him conjure up again in his mind a picture of himself having fun in school and examine components which he didn't mention before, say whether he now felt this was a part of 'having fun in school', and if he did not, why not. This again was to serve to help each child clarify for himself

what exactly were the components of his fuzzy concept. As in Step III, these latter questions were added as the checking process and did not occur in the original procedure.

The first child felt that drawing was also a part of 'having fun in school', and that he especially liked drawing with crayons. He also felt that playing football was also a part. When after saying each of these he was given the questions of the checking process, he reaffirmed that they both were part of 'having fun in school'.

The checking process in most cases was facilitative here for each child to be more sure of what he meant by 'having fun in school', as three of the four children were able to say whether a component that he mentioned was a part.

The checking process for Step V consisted of having each child confirm that he was sure that a thing, thought up by him as something having nothing to do with 'having fun in school', did or did not in fact have anything to do with 'having fun in school'. This checking process did not occur in the original procedure and was to help each child further clarify for himself the exact boundaries of his fuzzy concept as brought forth in Step V proper.

One child confirmed through the checking process that playing football, baseball, and soccer did not have anything to do with 'having fun in school' because they were not fun.

The checking process seemed to be helpful with Step V in helping each child to make more sure that each item which he mentioned did or did not have anything to do with 'having fun in school', as it had each child reconsider each item in light of this and had him state which case it was. It was successful to the point that three of the four children could state reasons why an item did or did not have anything to do with 'having fun in school'.

In conclusion, it would seem that the checking process is useful in

helping each child to make more sure what the components exactly are of what he means by 'having fun in school'.

It seems appropriate finally to consider each experimental step individually and generally conclude whether it was successful with these four children. Step I was successful because each child was able to generate components of their fuzzy concept 'having fun in school'; for example, "kids are eating lunch", and "playing in the playground". The step was additionally successful as it was able to elicit operational and partially operational components: "me and Scott are playing Easy Money", "I pick up a card", and "I'm playing with blocks".

Step II was successful with all children as all were able to generate components of their concept of not 'having fun in school', and it was additionally successful as it was able to elicit some partially operational components; for example, "we were playing baseball and I got hit in the head with the ball", and "nobody's playing with me".

Step III also was successful with all children as all were able to say whether each test of completeness item was a part of what he or she meant by 'having fun in school', and in many instances items reminded the children of other things that were a part of their concept that hadn't been thought of before; for example, to the item 'playing baseball' a child responded that it was a part of 'having fun in school' and that it made him think of playing basketball as also a part. To the item 'playing games' another child responded that that made her think of building puzzles as part of 'having fun in school'

Step IV was successful in some respects and not successful in others. It was successful in the sense that three of the four children were able from the instructions to generate additional parts of their fuzzy concept. It was not successful in the respect that one child could not give any response to the instructions.

Step V was successful with all children because each was able to think up things not having anything to do with 'having fun in school' and to say whether each thing did or did not. One child thought up music as having nothing to do with the fuzzy concept and decided that it indeed did not, because he didn't like music. Another thought up going camping as having nothing to do with the fuzzy concept and decided that although it was fun it had nothing in fact to do with school.

The list of behaviors mentioned in the first section of this report is appended to the report and appears as a table of frequency counts. The list was used to record the number of times and by whom each of the behaviors occurred. This was so that in case of an inability by a child to operationalize, some record would be available whereby the child's behavior during the implementation of the experiment might give a clue as to why. Since no child failed to operationalize, this list was not used.

Restatement of Procedures for Operationalization of Fuzzy Concept
for Children ages 7-8

Fuzzy Concept: having fun in school

1. "Think of yourself as having fun in school. Build a picture of it in your mind. You're in school with your teachers and the other kids, and you're having as much fun in school as you've ever had. It couldn't be better. I want you to watch this picture and watch yourself having fun in school; watch everything very carefully. Look at it, and tell me everything you see happening."

After each item verbalized by the child, the question, "Are you sure that this is a part of 'having fun in school'?" will be asked.

2. "Now, I want you to think of yourself as not having fun in school. Build a picture of it in your mind. You're in school with the other kids and your teachers, and you're not having fun at all. I want you to watch this picture and watch yourself not having fun in school. Watch everything very closely. Look at it, and tell me everything you see that's happening."

After each item given, the question, "Are you sure that this is not a part of 'having fun in school'?" will be asked.

3. A list compiled by an adult and a child who have been through the first hypothetical situation as stated here will be read off, item by item, to each child, with this question following each item: "Does this make you think of anything else that is a part of 'having fun in school' or is this a part of 'having fun in school'?"

4.a. "Okay, now I want you to go back to picturing yourself as having fun in school. I want you to look at the picture again. There are things going on in the picture that you didn't talk about before, because before you didn't think those things were part of what 'having fun in school' means. I want you to tell me all those things that you didn't talk about before." (Pause.)
4.b. "Okay?" (Pause.) "Now, tell me why those things aren't a part of 'having fun in school'."

After each response given, the questions, "Why isn't this a part of 'having fun in school?" and/or "Do you think now that it is a part of 'having fun in school'?" will be asked.

5.a. "Okay, not I want you to think up things that don't have anything to do with 'having fun in school' and think about them." (Pause.)
5.b. "Okay?" (Pause.) "Now, tell me if each one does have anything to do with 'having fun in school', or if it doesn't."

After each response given, the question, "Are you sure that this does (doesn't) have anything to do with 'having fun in school'?" will be asked.

TEST OF COMPLETENESS LIST

making a puzzle

people looking for pieces in puzzle

people typing

writing pictures on overhead pro

planting flowers in cups

teacher talking to someone whose feelings are hurt

talking

others talking

people playing games

sunlight in room

carpet

plants around room

library

reading center

math center

listening center

TEST OF COMPLETENESS LIST (cont'd)

We're in school and it's only a half an hour to recess where my friends and I can go out and play baseball. It is a warm spring day and not long before summer vacation. Inside the classroom Miss Murphy is teaching and all the kids are out of their seats. We're all crowded around the table in the front of the room where Miss Murphy is showing us a big sort of fish tank with some moss and rocks in it and inside the tank is a baby crocodile! We are having a lesson about reptiles and Miss Murphy is teaching us and showing us all about different kinds of reptiles. All the girls keep screaming and running away when it gets near them. Billy and Terry are pushing and shoving each other and the girls.

Everybody is laughing and having a good time. The crocodile has hundreds of needle sharp teeth and it is really fabulous. It has black beady eyes that keep turning from side to side as it looks at anybody who comes near it. When he opens his mouth you can see his pink glistening tongue and those incredible gleaming white teeth! Miss Murphy is smiling and her voice is warm and reassuring voice as she tells us about all the amazing things that there are to know about reptiles. She is telling us about the men who catch these animals and study animals them, and where the animals come from. She makes me feel like I want to do this when I grow up. All of a sudden the bell rings and all the boys running out of the room and grab their baseball gloves. When we running out on the grass we're all pretending that we're crocodiles and snakes and lizards and monsters.

We're all tackling each other and rolling on the ground and having a good time.

BEHAVIORS WHICH COMBINED, MAY INDICATE THAT CHILD

IS HAVING TROUBLE OPERATIONALIZING

	D	C	B	A
child looks around (not paying attention)				
researcher has to repeat instructions to get attention		*		
child frowns				
child is restless in his seat				*
child keeps asking what he is supposed to do (3-4 or more)				
child has frustrated look on face		*		
child gives only one or two responses to a request	*	*		*
child sits for a period of time and does not say anything				
behaviors which combined, indicated that child is not having trouble operationalizing				
child gives directly observable things as answers	*	*	*	*
child gives many answers to a request, even after researcher should have to repeat the task up to two times. (5-6 or more)	*			*

CHILD A

STEP I

Me and Scot are playing Easy Money
He spins 2 6's (= 12)
He picks up card
Card says "Pay $10 for tuition"
I spin and get 5 on one die and 5 on another
I pick up card
Card says "Pay $15 for car"
Andrea and Bobbie are making pictures with popcorn
Mrs. Backer's studying about animals
It's time for recess
First, lunch
I have a bologna sandwich and mustard
Kids eating lunch
Mrs. Backer is in class having a conference with Mrs. Williams and Mrs. Huddleson

STEP II

I do my work
I go to teacher to see if it's right and it's not
I have to go back and do it
I bring it again and it's right
I go to do my study book
I have to do three pages
I did all three pages and all three are right
I check them and two are right
I go back and do the third
It's time for recess and my best friend knocks me down
We were playing baseball and I got hit in the head with the ball
John struck out
I come home and then I tell my mother can I play with the miniature hockey set and she says all right
My brother wants to play and he hits me with a bat

STEP III

Yes
Yes - when we play games
Yes - (my mother's a typist)
No
Yes - I grow a mustard plant
No - (I don't like hurt feelings)
Yes - if it's about sports
No
Yes - (if I'm in games)
Yes - (so it's not cold)
Yes
No
No
No
No - (likes writing better)
No
Yes - basketball
Yes - not when it melts

No - I can't see
No - baby alligator
No - likes animal lessons
Yes - is doing a report on them
No
Yes
No - likes gym and recess
No - doesn't like her voice
Yes - has lots of animals
No - no bell
No
Yes - no glove in school
Yes
No - would eat me up

STEP III (cont'd)

Yes - went to Florida and got Disney flashlight - brother got jackknife - sister got teddy bear
No - (can't do work)
Yes - has many animals in classroom

Yes - in football
Yes

STEP IV

Drawing is a part - he likes it with crayons
Playing football - intercepts and goes all the way down
Basketball - tipped it in and they won

STEP V

Reading - doesn't like it
Music - doesn't like it
Camping
Go to theater - no theater in school but an auditorium
Planting a tree - no
Painting a sign - no room to do work

	a	b	c	d	T
I					
II					
III					
IV					
V					
T					

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